ATTACHMENT A

REMARKS

The interview held with Examiner Kebede on November 4, 2003, is gratefully acknowledged. The courtesy and cooperative spirit shown by the Examiner during the interview is much appreciated. The interview basically centered around the rejection on prior art and amended claims were discussed. The restriction requirement was also discussed and the Examiner agreed to withdraw the requirement. The substance of the discussions at the interview is incorporated in the remarks which follow.

Considering the matters raised in the Office Action in the same order as raised, as indicated above, the Examiner agreed to withdraw the requirement for restriction. The reasons why the restriction requirement is to be withdrawn are set forth in the last response. With the withdrawal of the requirement, linking apparatus claim 16 should be examined along with the rest of the claims. Further, because claim 16 is the apparatus counterpart of claim 10, if claims 10 and 16 are allowed, dependent apparatus claim 17 should be joined with claim 16 and all of the claims allowed.

Turning to the rejections on prior art, claims 10, 11 and 13-15 have been rejected under 35 USC 102(b) as being "anticipated by" the cited Schoenborn patent while claim 12 has been rejected under 35 USC 103(a) as being "unpatentable over" the Schoenborn patent "in view of Grimbergen et al. (US/6,081,334)." These rejections are respectfully traversed although, as discussed during the interview and mentioned above, the claims have been amended in order to even more clearly define over the cited references.

It is first noted that during etching of a material, the plasma resulting from the etching process emits a light having a wavelength which characterizes the material being etched. In the Schoenborn patent, a single layer is deposited on a substrate. As a result, in monitoring the etching process, interferometry is preferably used (see column 6, lines 46-58). Moreover, in determining the precise thickness of the layer being etched, precise measurements, performed using interferometry, are required (see also column 7, lines 33-44).

In contrast, in the method and apparatus according to the present invention, there is no need for the use of interferometry or ellipsometry in accurately determining

the thickness of the layer being etched. In accordance with the present invention, a first layer, i.e., the layer to be etched, is deposited on a second layer, and the plasma resulting from the beginning of the etching of the <u>second layer</u> emits a light having a wavelength ("spectral component") which characterizes the <u>second layer</u>. Thus, while it is light from the <u>second</u> layer that is to be detected, the etching is basically performed on the <u>first layer</u>. In other words, when the engraving front (which starts in the first layer) reaches the second layer, light is emitted which is of the wavelength that characterizes the second layer. At the moment when the light having this wavelength is detected, one knows that the engraving front has reached the second layer and thus the etching process is stopped. In this situation, the first layer has been locally removed so as to uncover the second layer. Because, as the speed of the engraving front (during the travel of the engraving front from the top of the first layer to the bottom of the first layer) is substantially constant is known, one can measure the thickness of the first layer on the basis of the point of time at which the etching process began and the moment at which the second layer is reached and the etching process is terminated.

As discussed during the interview, claims 10 and 16 now provide that the engraving front progresses at a predetermined speed and that the thickness of the first layer (the layer to be measured) is computed on the basis of the moment of (i) occurrence of an increase in the measured light amplitude corresponding to the point in time at which the engraving front reaches the second layer and (ii) the predetermined speed of the engraving front. It is noted that the predetermined speed of the engraving front is discussed in the first full paragraph on page 11 of the specification. Further, it is respectfully submitted that to the extent that the specification does not discuss a specific engraving speed, the speeds at which an engraving front typically progress are well known in the art and that the only thing that is of importance in this regard insofar as the present invention is concerned is that a predetermined (i.e., substantially constant) speed is being used.

It is respectfully submitted that the present invention as defined in the claims presented patentably distinguishes from the teachings of the Shoenborn patent at least because the invention provides two different layers of different materials and relies on detecting of light emitted when the engraving front reaches the <u>second layer</u> in

calculating the thickness of the first layer. In contrast, in the Shoenborn patent, a single layer is used and all measurements are made with respect to this single layer. An important advantage of the present invention that accrues from this difference is that the use of interferometry or ellipsometry is not required in providing a thickness measurement.

Finally, it is noted that amended claim 10 is basically a combination of previous claim 10 and previous (now canceled) claim 14. In the latter, the thickness of the first layer was recited as being calculated on the basis of a linear combination linking the engraving time and the computer thickness of the layer to be measured, i.e., based on the linear relation resulting from the fact that the speed of the engraving front is substantially constant (thickness = rate x time). Accordingly, no new issues are raised by the amendments to claims 10 and 16.

Allowance of the application in its present form is respectfully solicited.

ATTACHMENT B

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

10. (Currently Amended) A method for measuring a thickness of a first layer,

said first layer to be measured being deposited on ~~an underlying layer and~~a second layer which is underneath said first layer,

said first and second layers being part of an integrated circuit,

said method being carried out, in real time, ~~through~~during an engraving reaction ~~during advance of~~wherein an engraving front ~~relative to at least a portion of said integrated circuit~~progresses from said first layer to said second, underneath layer,

said engraving front progressing at a predetermined speed, and

said engraving reaction, ~~being~~when applied to said ~~underlying~~second, underneath layer, ~~so as to generate~~generating a light emission having at least one spectral component,

said method comprising the steps of:

a) measuring an amplitude of light emitted during the engraving reaction, in a selected spectral range comprising said at least one spectral component~~;~~,

b) establishing a distribution of said amplitude as a function of time;

c) determining, from said distribution, a ~~transition of~~moment of occurrence of an increase in said measured amplitude, said moment corresponding to a point in time at which the~~as said~~ engraving front ~~passes from said layer to be measured to said underlying~~reaches the second, underneath layer;

d) and computing the thickness of said first layer to be measured, ~~based~~ on the basis of said ~~distribution and said transition, by correlating said transition to said distribution~~ moment and said predetermined speed of the engraving front.

11. (Currently Amended) The method of claim 10, wherein said spectral component of said ~~underlying~~underneath layer is a perceptible emission wavelength characteristic of said ~~underlying~~underneath layer.

12. (Currently Amended) The method of claim 10, wherein said first layer to be measured comprises ~~a second layer~~ a layer of silicon oxide and the ~~underlying~~second, underneath layer comprises a barrier layer of silicon nitride, and wherein said at least one spectral component of said light emission generated when said engraving reaction is applied to said ~~underlying~~ second, underneath layer ~~comprises~~is a spectral line SiN at 405 nm.

13. (Currently Amended) The method of claim 10, wherein:

said ~~correlation of said~~ distribution ~~to said transition is proportional to an engraving time period measured between~~starts from a beginning ~~point~~time of the engraving reaction at which said amplitude constitutes a reference amplitude, and

a further ~~point in~~ time, corresponding to said moment, when said amplitude reaches 150% of the reference amplitude.

14. (CANCELED)

15. (Currently Amended) The method of claim 10, wherein the step comprising measuring the amplitude of ~~the~~said light emitted is performed by means of a monochromator.

16. (Currently Amended) A device for measuring a thickness of a first layer,

said first layer to be measured being deposited on ~~an underlying layer and being part of an integrated circuit~~ a second layer which is underneath said first layer,

said first and second layers being part of an integrated circuit;

the measuring of the thickness of said first layer ~~to be measured~~, in real time, ~~through~~during an engraving reaction ~~during advance of~~wherein an engraving front ~~relative to at least a portion of said integrated circuit~~progresses from said first layer to said second, underneath layer,

said engraving front progressing at a predetermined speed, and

said engraving reaction, ~~being~~when applied to said ~~underlying~~second, underneath layer, ~~so as to generate~~generating a light emission having at least one spectral component,

said device comprising:

first means for measuring an amplitude of light emitted during the engraving reaction, in a selected spectral range comprising said at least one spectral component;

and second means for:

establishing a distribution of said amplitude as a function of time;

determining, from said distribution, a ~~transition of the amplitude as said engraving front passes from said layer to be measured to said underlying~~moment of occurrence of an increase of said measure amplitude, said moment corresponding to a point in time at which the engraving front reaches the second underneath layer; and

computing the thickness of said first layer to be measured, on the basis of said ~~distribution~~moment and said ~~transition, by correlating said transition to said distribution~~predetermined speed of the engraving front.

17. (Currently Amended) The device of claim 16, further comprising:

a reactor for engraving said integrated circuit, said reactor being fitted with an optical window enabling the engraving reaction to be optically observed;

a monochromator, ~~having an operational~~the wavelength of which is centered on a characteristic value of said ~~underlying~~second, underneath layer, for enabling amplitude values of the emitted light to be measured; and

means for determining a time period taken ~~for~~by the engraving front produced within said reactor to reach the ~~underlying~~second, underneath layer and for computing an effective thickness of said first layer to be measured by a linear combination linking said effective thickness to the time taken by said engraving front to reach said ~~underlying~~second, underneath layer.